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PATENT
Case No. 7117-89

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: LAMPERT et al.	
Serial No. 09/016,002	Group Art Unit: 3624
Title: PARCELIZED GEOGRAPHIC DATA MEDIUM WITH INTERNAL SPATIAL INDICES AND METHOD AND SYSTEM FOR USE AND FORMATION THEREOF	Examiner: ELLA COLBERT
Filed: January 30, 1998	

APPEAL BRIEF

This appeal brief is submitted pursuant to 37 CFR 1.192. This is an appeal of the final Office Action dated March 29, 2002. A Notice of Appeal was filed on August 29, 2002. A petition for an extension of time accompanies this brief.

(1) REAL PARTY IN INTEREST

The real party in interest is Navigation Technologies Corporation, a privately held corporation, having its headquarters in Chicago, Illinois.

(2) RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

(3) STATUS OF CLAIMS

Claims 1, 11, 12, 16, 18, 21, and 22 have been canceled.

Claims 2-10, 13-15, 17, 19, 20, and 23-29 are pending.

All the pending claims (i.e., Claims 2-10, 13-15, 17, 19, 20, and 23-29) were rejected as obvious over U.S. Pat. No. 4,888,698 ("Driessen").

All the pending claims have been appealed.

(4) STATUS OF AMENDMENTS

There has been no amendment filed subsequent to the final rejection.

(5) SUMMARY OF INVENTION

Appellant's claims relate to an improvement for a database that contains data that represent geographic features located in a region. Appellant's claims also relate to a method for forming a database with such an improvement, as well as a method and program for using a database that contains such an improvement.

The prior art teaches that a database that contains data that represent geographic features can be organized spatially into parcels (Appellant's specification: page 3, lines 12-20). Organizing a database spatially means that the data records that represent features located close together in the geographic region are themselves located close together in the database. The prior art teaches that one way to organize a database spatially is to form "parcels" of data records. First, the entire geographic region being represented (labeled 12 in Appellant's FIG. 1) is divided into rectangular areas (i.e., sub-regions, labeled 204(1), 204(2), 204(3), 204(4), 204(5) and 204(6) in Appellant's FIG. 6). Then, the data records that represent the features located in each of these rectangular areas are separated into groups, referred to as "parcels," with each parcel containing the data records that represent the features located in a corresponding separate

one of the rectangular areas into which the entire geographic region had been divided (Appellant's specification: page 20, lines 8-21). Then, while maintaining the parcel groupings, the data records are stored to form a database (Appellant's specification: page 28, lines 19-25). An index for the database is formed that associates the parcels (and therefore the data records grouped together within the parcel) to the geographic boundaries of their respective associated rectangular areas. (*Ibid.*) When using the database, this index is used to find data records that represent geographic features, given the locations (e.g., geographic coordinates) of the features.

Appellant's claims relate to an improvement of this prior art method.

Appellant's claims relate to adding at least one new index for each parcel of a database that is organized spatially into parcels (Appellant's specification: page 29, lines 7-9). This new index works as follows. The rectangular area (e.g., 204(1), 204(2), 204(3), 204(4), 204(5) or 204(6) in Appellant's FIG. 6) associated with each parcel of data is further divided into a plurality of sub-areas (labeled 307(0) - 307(7) in Appellant's FIG. 7 and described in Appellant's specification: page 30, lines 23-26). Then, the geographic feature represented by each data record contained in the parcel is examined to determine in which of these sub-areas the geographic feature is located (Appellant's specification: page 32, lines 4-23). Then, the new index (320 in Appellant's FIG. 10 and Appellant's specification: page 32 lines 4-23) is formed for each parcel that identifies, for each data record contained in the parcel, each sub-area in which the geographic feature represented by the data record is located.

Appellant's improvement for a database containing data that represent geographic features facilitates use of the database by applications and systems that use the database.

For example, when a navigation system displays an image of a geographic area that spans portions of the rectangular areas corresponding to several parcels of data, the data records from each of the parcels needed to render the image can be identified quickly, thereby providing improved navigation system performance (Appellant's specification: page 33, line 6 – page 36, line 25).

(6) ISSUES

At issue is whether Appellant's Claims 2-10, 13-15, 17, 19, 20, and 23-29 are obvious under 35 U.S.C. 103 over Driessen (U.S. Pat. No. 4,888,698).

(7) GROUPING OF CLAIMS

Appellant states that the appealed claims do not stand or fall together. Appellant identifies 10 separate groupings of claims.

Group	Claims corresponding to Group
1 -	Claims 3, 8-10, 19, 20, 23 and 26-28
2 -	Claim 2
3 -	Claim 4
4 -	Claims 5, 17 and 29
5 -	Claim 6
6 -	Claim 7
7 -	Claim 24
8 -	Claims 13 and 25
9 -	Claim 14
10 -	Claim 15

(8) ARGUMENT

Group 1 (Claims 3, 8-10, 19, 20, 23 and 26-28)

(Group 1 includes independent Claims 23, 26 and 27. Claims 3 and 8-10 depend from independent base Claim 23 and Claims 19, 20 and 28 depend from independent base Claim 27. All these claims distinguish Driessen for similar reasons.)

A. Appellant's independent Claim 23

Appellant's independent Claim 23 is a Jepson-type claim. The preamble of Appellant's Claim 23 recites the step, known from the prior art, of separating data that represent geographic features into parcels spatially. The body of Appellant's Claim 23 recites the new steps of *"dividing the area associated"* with a *"parcel" "into a plurality of sub-areas"* and *"storing a first index that identifies, for each of the data entities contained in the parcel, each of the sub-areas intersected by the geographic feature represented thereby."*

(i). The Driessen patent

In the final Office Action, Appellant's independent Claim 23 was rejected as obvious over Driessen.[1] Driessen discloses a method for organizing a database for geographic data into parcels.[2] Driessen discloses forming main cells that correspond to rectangular geographic areas (Driessen: column 1, lines 41-45; column 6, lines 5-9).

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[1] Driessen (U.S. Pat. No. 4,888,698) was cited by Appellant in an Information Disclosure Statement mailed on May 15, 1998.

[2] Driessen defines the term "parcel" to mean essentially the same thing as Appellant; *compare* Driessen: column 6, lines 12-15 and Appellant's specification: page 13, line 28-page 14, line 3.

According to Driessen, if the data content corresponding to a main cell is small enough to form a parcel, the data content of the main cell is used to form a parcel and the main cell is not subdivided any further (Driessen: column 1, lines 48-52 and column 6, lines 39-41). However, Driessen provides that if the data content of a main cell is larger than a desired parcel size, the main cell is divided into smaller blocks (Driessen: column 1, lines 53-61 and column 6, lines 41-48). This process of division is repeated until a block has a data content small enough to form a parcel (Driessen: column 6, lines 57-63). Driessen refers to a block formed from a main cell that is small enough to form a parcel as a "base cell" (Driessen: column 6, lines 64-66). Once the data are organized into parcels, the data are stored "parcelwise" in a memory (Driessen: column 7, lines 40-43).

Driessen also discloses a way to find parcels of data in a "mass memory"[3] (Driessen: column 7, lines 43-54). Driessen discloses formation of two tables: a main cell table and a base cell table (Driessen: column 8, lines 13-17 and lines 52-54). These two tables together provide a means to find in a mass memory the data associated with given geographic locations. The main cell table includes a "first identifier" that relates the division pattern associated with the formation of the base cells with a pointer to the location in the mass memory where data about the main cell is stored (Driessen: column 8, lines 29-44). For those main cells that have been further divided into base cells, a pointer in the main cell table points to a base cell table (Driessen: column 8, lines 52-55). The base cell table relates a base cell identifier to an address in the mass memory at which the data parcel is stored (Driessen: column 8, line 65-column 9, line 15).

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[3] Driessen uses the term "mass memory" to refer to a disc, such as a CD-ROM (Driessen: column 6, lines 14-18).

(ii). The final Office Action

As stated above, Appellant's Claim 23 is a Jepson-type claim in which the preamble recites the well-known prior art process of separating data that represent geographic features into parcels spatially. Appellant acknowledges that Driessen discloses the prior art process recited in the preamble of Claim 23.[4] However, the process of separating data that represent geographic features into parcels spatially did not originate with Driessen. Driessen also acknowledges this spatial parcelization process as prior art, citing the 1984 publication by Matsuyama et al., entitled "A file organization for Geographic information systems based on Spatial Proximity" (Driessen: column 1, line 34 - column 2, line 20).

The body of Appellant's Claim 23 recites two new steps, i.e., *"dividing the area associated"* with a *"parcel"* *"into a plurality of sub-areas"* and *"storing a first index that identifies, for each of the data entities contained in the parcel, each of the sub-areas intersected by the geographic feature represented thereby."* In the final Office Action, the Examiner asserted that Driessen disclosed the Appellant's *"dividing"* step at column 5, lines 15-33. Regarding the *"storing a first index"* step, the Examiner acknowledged that Driessen did not disclose the *"first index"* recited in Appellant's Claim 23. However, the Examiner took the position that it would have been obvious to provide a *"first index"* for the reason that "indexes are used to speed up the retrieval of data or files

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[4] Appellant refers specifically to the Driessen patent (U.S. Pat. No. 4,888,698) in the application specification at page 28, lines 2-3: "Still another method of parcelization to which the disclosed subject matter can be applied is described in U.S. Pat. No. 4,888,698."

and to access the files or data in a sorted order by creating an alphabetized list of keywords" (Office Action, page 5, line 19 – page 6, line 2).

(iii). Appellant's Claim 23 is not obvious over Driessen

The rejection of Appellant's Claim 23 as obvious over Driessen is in error for at least any one of the following reasons.

1. **Driessen does not disclose or suggest the first step recited in the body of Appellant's Claim 23 of *"dividing the area associated"* with a *"parcel" "into a plurality of sub-areas."***

The Examiner's position is incorrect that Driessen discloses the step in Appellant's Claim 23 of *"dividing the area associated"* with a *"parcel" "into a plurality of sub-areas."* The passage cited by the Examiner to support this position (Driessen: column 5, lines 15-33) is both misinterpreted and taken out of context. This passage from Driessen does not refer to the geographic area associated with a parcel, but instead is part of the disclosure that explains the need for dividing a large database into smaller parts. The paragraphs in Driessen that follow the passage cited by the Examiner explain that the need for dividing a large database containing map data can be addressed by forming parcels (Driessen: column 5, line 34-column 6, line 46).

According to Driessen, once a parcel is formed from either a main cell or a base cell, the area associated with the parcel (i.e., the main cell or base cell) is not divided any further. Therefore, Driessen does not disclose the *"dividing"* step of Appellant's Claim 23. One reason why Driessen does not disclose further divisions of main or base cells from which parcels are formed is that the main and base cell tables disclosed by Driessen are used for finding entire parcels of data on a disc. Driessen has no disclosure

that relates to a need to find particular data items within a parcel. Therefore, Driessen has no motivation to perform any operations, such as further divisions, of the main or base cells associated with parcels. Therefore, not only is the *"dividing"* step of Appellant's Claim 23 not disclosed by Driessen, but Driessen provides no motivation to perform the *"dividing"* step.

2. Driessen does not disclose or suggest the second step recited in the body of Appellant's Claim 23 of *"storing a first index that identifies, for each of the data entities contained in the parcel, each of the sub-areas intersected by the geographic feature represented thereby."*

Driessen does not disclose a *"first index"* (or any similar data structure) that *"identifies for each data entity in a parcel, each of the sub-areas intersected by the geographic feature represented thereby."* Moreover, Driessen has no suggestion whatsoever that relates to any index or equivalent structure for finding data *within a parcel* or any suggestion about the desirability, need or benefit for providing a structure to facilitate any operation with data *within a parcel*.

In the final Office Action, the Examiner acknowledged that Driessen did not disclose the *"first index"* recited in Appellant's Claim 23. However, the Examiner took the position that it would have been obvious to provide a *"first index"* for the reason that "indexes are used to speed up the retrieval of data or files and to access the files or data in a sorted order by creating an alphabetized list of keywords" (Office Action, page 5, line 19 – page 6, line 2).

The Examiner's reason why it would be obvious to modify Driessen to include the *"first index"* of Appellant's Claim 23 is in error. Driessen has no disclosure that relates to creation of an "alphabetized list of keywords." In fact, the Examiner's

suggestion for the creation of an "alphabetized list of keywords" appears to bear no relevance whatsoever to either Driessen or Appellant's claims.

3. The *"first index"* recited in Appellant's Claim 23 is completely different structurally and functionally than the cell tables disclosed in Driessen.

The final reason why Appellant's Claim 23 is not obvious over Driessen is also the least disputable. Even if the Examiner's position were accepted that it would be obvious in view of Driessen to include a *"first index"* for the reason stated in the final Office Action, Appellant's Claim 23 is not obvious because the *"first index"* recited in Appellant's Claim 23 is completely different structurally and performs a completely different function compared to anything disclosed in or suggested by Driessen.

An index is a data structure that includes a listing of data items associated with a key field. The main cell and base cell tables disclosed in Driessen perform an indexing function that locates parcels in a memory, given geographic locations. With Driessen, the main cell and base cell tables are used to answer the query "Where (on a disc) is the data that represents the geographic feature that has a given geographic location (x latitude and y longitude)?" In the cell tables of Driessen, the index key is geographic location. By comparison, the *"first index"* of Appellant's Claim 23 is used to find the *"sub-areas"* intersected by a geographic feature represented by a *"data entity"*, given the *"data entity."* Appellant's *"first index"* is used to answer the query "Which sub-areas formed of the rectangular area corresponding to this parcel does this data entity intersect?" In Appellant's *"first index"*, the key field is a data entity in the parcel.

Whereas the main cell and base cell tables in Driessen are used to find the data on a disc, the *"first index"* of Appellant's Claim 23 is used to determine something about the

data in a parcel after, the parcel containing the data has been found. This explains why Appellant's claim is written as a Jepson claim. It is an improvement over the prior art type of database disclosed by Driessen (and Matsuyama and many others). The improvement recited in Appellant's Claim 23 provides a different type of index that associates together different data items to perform a different, and entirely non-obvious, function.

B. Appellant's Claims 26 and 27

Appellant's independent Claims 26 and 27 are also Jepson-type claims. Appellant's Claims 26 and 27 both recite a *"geographic database"* product. In these claims, the preamble portions recite that the *"geographic database"* is spatially organized into *"parcels."* In Claim 26, the body portion of the claim recites that the *"geographic database"* includes a *"plurality of index tables of a first type"* each of which is associated with a *"parcel"* and each of which includes a *"reference"* to a *"data record"* and a *"reference to . . . . groupings of . . . data records . . . based upon a division of the area associated with the parcel into a plurality of smaller sub-areas."* In Claim 27, the body portion of the claim recites that the *"geographic database"* includes *"indexes"* each of which is associated with a *"parcel"*, wherein each *"index"* relates the *"data entities"* in the *"parcel"* to a *"rectangular sub-area formed of the rectangular area associated with the parcel."* Claims 26 and 27 are not obvious over Driessen at least for the same reasons as stated above with respect to Claim 23.

Group 2 (Claim 2)

Claim 2 depends from independent Claim 23 and recites that the *"first index"* is a *"bitmap."* Appellant's Claim 2 was rejected as obvious over Driessen. Even if it were concluded that Appellant's independent Claim 23 was obvious over Driessen, there is no suggestion to modify the database disclosed by Driessen to use a *"bitmap"* as the *"first index."* Accordingly, using a *"bitmap"* as the *"first index"*, as recited in Appellant's Claim 2, would not be obvious in view of Driessen.

Group 3 (Claim 4)

Claim 4 depends from independent base Claim 23 and recites that the *"first index"* is *"stored internally of the parcel associated therewith."* Claim 4 was rejected as obvious over Driessen. Even if it were concluded that Appellant's independent base Claim 23 was obvious over Driessen, Driessen contains no suggestion regarding where the *"first index"* would be stored. Accordingly, storing the *"first index"* *"internally of the parcel associated therewith"*, as recited in Appellant's Claim 4, would not be obvious in view of Driessen.

Group 4 (Claims 5, 17 and 29)

(Group 4 includes independent Claim 29 and dependent Claims 5 and 17. Dependent Claim 5 depends from independent base Claim 23 and dependent Claim 17 depends from independent base Claim 26. Claims 5, 17 and 29 distinguish Driessen for similar reasons.)

All the reasons why the claims of Group 1 (i.e., Claims 3, 8-10, 19, 20, 23 and 26-28) are not obvious over Driessen apply as well to the claims of Group 4 (i.e., Claims 5, 17 and 29). In addition, the claims of Group 4 include additional limitations that further distinguish Driessen.

Appellant's Claim 29 is an independent claim, written in the Jepson-format, that recites limitations that are similar to those of independent Claim 23 (in Group 1, above). In addition, Appellant's Claim 29 recites that a *"first index"* associated with each *"parcel"* defines the *"sub-areas"* for the *"parcel"* and a *"second index"* associates each *"data record"* in the *"parcel"* to at least one of the defined *"sub-areas."*

As explained above in connection with Appellant's Claim 23 (in Group 1), Driessen does not disclose or suggest a *"first index"* associated with each *"parcel."* Even if it were concluded that Appellant's independent Claim 23 was obvious over Driessen, Driessen contains no disclosure or suggestion regarding a *"second index"* associated with each *"parcel."* Accordingly, having a *"second index"* associated with each *"parcel"*, as recited in Appellant's Claim 29, would not be obvious in view of Driessen.

Dependent Claim 5 and 17 also recite a *"second index"* associated with each *"parcel."* Even if it were concluded that Appellant's independent base Claims 23 and 26 (in Group 1) were obvious over Driessen, Driessen contains no disclosure or suggestion regarding a *"second index"* associated with each *"parcel."* Accordingly, having a *"second index"* associated with each *"parcel"*, as recited in Appellant's dependent Claims 5 and 17, would not be obvious in view of Driessen.

Group 5 (Claim 6)

Claim 6 depends from dependent Claim 5, which depends from independent base Claim 23. Claim 6 recites that the *"second index"* is a *"kd-tree index."* Claim 6 was rejected as obvious over Driessen. Even if it were concluded that Appellant's independent base Claim 23 and dependent Claim 5 were obvious over Driessen, Driessen contains no suggestion regarding use of a *"kd-tree index."* Accordingly, using a *"kd-tree index"* as the *"second index"* as recited in Appellant's dependent Claim 6, would not be obvious in view of Driessen.

Group 6 (Claim 7)

Claim 7 depends from dependent Claim 5, which depends from independent base Claim 23. Claim 7 recites that the *"second index is stored internally of said parcel."* Claim 7 was rejected as obvious over Driessen. Even if it were concluded that Appellant's independent base Claim 23 and dependent Claim 5 were obvious over Driessen, Driessen contains no suggestion regarding where the *"second index"* would be stored. Accordingly, storing the *"second index" "internally of the parcel associated therewith"*, as recited in Appellant's Claim 7, would not be obvious in view of Driessen.

Group 7 (Claim 24)

Claim 24 is an independent claim that relates to a method of using a geographic database. Claim 24 recites the steps of *"accepting specification of a search area"*, *"identifying a parcel of data . . . that contains data entities that represent geographic features encompassed within a first rectangular area located within the geographic*

region, wherein the first rectangular area intersects said search area", "using" a *"first index"* associated with a *"parcel"* that identifies which of a *"plurality of rectangular sub-areas"* into which the *"first rectangular area"* associated with the *"parcel"* is divided intersect the *"search area"* and *"using" "a second index"* associated with the *"parcel"* that identifies the *"data entities"* contained in the *"parcel"* that *"intersect each of the plurality of rectangular sub-areas identified as intersecting the search area."*

Claim 24 is not obvious over Driessen for any of three reasons. First, Claim 24 is not obvious over Driessen because Driessen does not suggest the step of *"accepting specification of a search area."* Second, Claim 24 is not obvious over Driessen because Driessen does not suggest the step of *"identifying a parcel of data . . . that contains data entities that represent geographic features encompassed within a first rectangular area located within the geographic region, wherein the first rectangular area intersects said search area."* Third, Claim 24 is not obvious over Driessen because Driessen does not suggest *"using"* either a *"first index"* or a *"second index"* associated with a *"parcel."* Accordingly, for any one of these reasons, Appellant's Claim 24 is not obvious over Driessen.

Group 8 (Claims 13 and 25)

(Group 8 includes independent Claim 25 and dependent Claim 13. Claim 13 depends from Claim 25. These claims distinguish Driessen for similar reasons.)

Claim 25 is an independent claim that relates to a method of using a *"geographic database"* to identify *"geographic features"* located within a *"search area."* Claim 25 recites that the *"geographic database"* contains *"data entities"* that represent

"geographic features" located in a *"geographic region"* and that the *"geographic database"* is organized into *"parcels"* each of which contains a *"subset"* of the *"data entities."* The *"subset"* in each *"parcel"* represents the *"geographic features"* encompassed within a separate respective one of a plurality of *"rectangular areas"* into which the *"geographic region"* is divided. Claim 25 recites the steps of *"(a) identifying each parcel that is associated with a rectangular area that intersects the search area"*, *"(b) . . . using a first index associated with the parcel to identify each rectangular sub-area formed of the rectangular area associated with the parcel that intersects the search area"* and *"(c) . . . using a second index associated with the parcel to identify each of the data entities contained therein that represents a geographic feature that intersects each of the sub-areas identified."* whereby the *"data entities"* identified in *"step (c)"* represent *"geographic features"* located in the *"search area."*

Claim 25 is not obvious over Driessen because Driessen does not suggest the step of *"using a first index associated with the parcel to identify each rectangular sub-area formed of the rectangular area associated with the parcel that intersects the search area."* Driessen also does not disclose or suggest the step of *"using a second index associated with the parcel to identify each of the data entities contained therein that represents a geographic feature that intersects each of the sub-areas identified."*

Group 9 (Claim 14)

Claim 14 depends from independent base Claim 25 and recites that the *"second index"* is a *"kd-tree index."* Claim 14 was rejected as obvious over Driessen. Even if it were concluded that Appellant's independent base Claim 25 was obvious over Driessen,

Driessen contains no suggestion regarding use of a *"kd-tree index."* Accordingly, using a *"kd-tree index"* as the *"second index"* would not be obvious in view of Driessen.

Group 10 (Claim 15)

Claim 15 depends from independent base Claim 25 and recites that the *"second index"* is a *"bitmap."* Claim 15 was rejected as obvious over Driessen. Even if it were concluded that Appellant's independent base Claim 25 was obvious over Driessen, Driessen contains no suggestion or motivation regarding use of a *"bitmap."* Accordingly, using a *"bitmap"* as the *"second index"* would not be obvious in view of Driessen.

ARGUMENT SUMMARY AND CONCLUSION

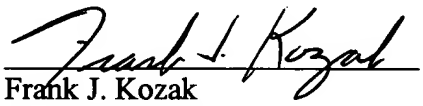
Appellant's claims relate to an improvement for a database that contains data that represent geographic features. In the final Office Action, the Examiner concluded that all 22 of Appellant's claims were obvious over a single prior art reference, Driessen. Driessen is a prior art patent that had been cited by Appellant in an information disclosure statement and that had been explicitly mentioned in Appellant's specification as disclosing a type of prior art database to which Appellant's improvement could be applied.

There is no disagreement that Driessen discloses the limitations recited in the preamble of each of Appellant's Jepson-format independent claims. However, Driessen fails to disclose the limitations (e.g., the *"first index"* associated with each *"parcel"* of data) in the body of each of Appellant's independent claims. Despite this fact however,

the Examiner concluded that all of Appellant's claims were obvious over Driessen. The Examiner reached this conclusion without identifying a second prior art reference that would motivate one of ordinary skill to modify Driessen to provide the missing limitations. The Examiner did not even identify a passage from Driessen that could be used as a basis for a modification to provide the missing limitations of Appellant's claims. The Examiner reached the conclusion that Appellant's claims are obvious without providing any teaching from the prior art that would lead one of ordinary skill to modify Driessen to provide the improvements recited in Appellant's claims. Therefore, the rejection of Appellant's claims as being obvious over Driessen is in error.

Appellant respectfully requests the Board to reverse the rejection of Claims 2-10, 13-15, 17, 19, 20, and 23-29.

Respectfully submitted,



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(9) APPENDIX

2. The method of Claim 23 wherein said first index is a bitmap.

3. The method of Claim 23 wherein each of the plurality of sub-areas is rectangular.

4. The method of Claim 23 wherein said first index is stored internally of the parcel associated therewith.

5. The method of Claim 23 further comprising:

with respect to each of said parcels, storing a second index identifying boundaries of each of said plurality of sub-areas.

6. The method of Claim 5 wherein said second index is a kd-tree index.

7. The method of Claim 5 wherein said second index is stored internally of said parcel.

8. The method of Claim 23 wherein with respect to each parcel, the data entities that represent geographic features encompassed by each of said plurality of sub-areas are approximately equal in number to the data entities that represent geographic features encompassed by each of the other of the plurality of sub-areas.

9. The method of Claim 23 wherein the data entities represent segments of roads in the geographic region.

10. The method of Claim 23 wherein the step of dividing forms eight sub-areas.

13. The method of Claim 25 wherein said data entities represent segments of roads.

14. The method of Claim 25 wherein the first index is a kd-tree index.

15. The method of Claim 25 wherein the second index is a bitmap.

17. The invention of Claim 26 further comprising:

a plurality of index tables of a second type, each of which is associated with a separate respective one of said plurality of parcels, wherein each of said index tables of the second type comprises:

a reference to each of a plurality of separate sub-areas into which the area associated with the respective parcel is divided.

19. The invention of Claim 27 wherein the sub-areas associated with each parcel are spatially organized.

20. The invention of Claim 27 wherein the data entities associated with each rectangular sub-area are approximately similar in number to each other.

23. A method for producing a database that represents geographic features in a geographic region comprising the steps of:

separating a plurality of data entities that represent the geographic features into a plurality of parcels,

wherein each parcel of said plurality of parcels contains a separate subset of said plurality of data entities, and

wherein the subset of said plurality of data entities contained in each parcel represents the geographic features located in a separate one of a plurality of areas into which the geographic region is divided;

wherein an improvement comprises:

for each parcel of said plurality of parcels,

dividing the area associated therewith into a plurality of sub-areas; and

storing a first index that identifies, for each of the data entities contained in the parcel, each of the sub-areas intersected by the geographic feature represented thereby,

whereby each sub-area in which a geographic feature is located can be determined by using the first index.

24. A method of using a geographic database comprising the steps of:

accepting specification of a search area in a geographic region represented by the geographic database;

identifying a parcel of data in the geographic database, wherein the parcel contains data entities that represent geographic features encompassed within a first rectangular area located within the geographic region, wherein the first rectangular area intersects said search area;

wherein an improvement comprises:

using a first index associated with the parcel to identify which of a plurality of rectangular sub-areas into which the first rectangular area is divided intersect the search area; and

using a second index associated with the parcel to identify the data entities contained in the parcel that intersect each of the plurality of rectangular sub-areas identified as intersecting the search area,

whereby the data entities that represent the geographic features located within the search area are determined.

25. A method of using a geographic database to identify geographic features located within a search area, wherein the geographic database contains data entities that represent geographic features located in a geographic region, and wherein the geographic database is organized into parcels, each of which contains a subset of all the data entities in the geographic database, and wherein the subset of data entities in each parcel represent the geographic features encompassed within a separate respective one of a

plurality of rectangular areas into which the geographic region is divided, wherein the method comprises the steps of:

(a) identifying each parcel that is associated with a rectangular area that intersects the search area;

wherein an improvement comprises:

(b) for each parcel identified in step (a), using a first index associated with the parcel to identify each rectangular sub-area formed of the rectangular area associated with the parcel that intersects the search area; and

(c) for each parcel identified in step (a), using a second index associated with the parcel to identify each of the data entities contained therein that represents a geographic feature that intersects each of the sub-areas identified in step (b),

whereby the data entities identified in step (c) represent geographic features located in the search area.

26. In a geographic database comprised of data records, wherein each data record represents a physical geographic feature in a geographic region,

wherein the data records are separated into a plurality of parcels,

wherein each parcel contains a separate portion of the data records, such that the portion of data records contained in each parcel represents those geographic features encompassed together in a separate respective one of a plurality of areas formed by dividing the geographic region,

wherein the improvement comprises:

a plurality of index tables of a first type, each of which is associated with a separate one of said plurality of parcels and wherein each of said index tables of the first type comprises:

a separate reference to each data record in the parcel to which said index table is associated; and

a reference to at least one of a plurality of groupings of the plurality of data records in the parcel,

wherein the plurality of groupings are based upon a division of the area associated with the parcel into a plurality of smaller sub-areas.

27. A geographic database comprising:

(a) data entities, each of which represents a geographic feature in a geographic region,

wherein the data entities are separated into a plurality of parcels,

wherein each parcel contains a subset of the data entities,

wherein the subset of data entities in each parcel represents those geographic features encompassed within a separate respective one of a plurality of rectangular areas into which the entire geographic region is divided; and

wherein an improvement comprises:

(b) a plurality of indexes, each of which is associated with a separate respective one of said plurality of parcels, and wherein each index relates each of the data entities in the subset of data entities contained in the parcel associated therewith to at

least one rectangular sub-area formed of the rectangular area associated with the parcel associated therewith,

wherein said geographic database is stored on a computer readable storage medium.

28. The invention of Claim 27 wherein said data entities represent segments of roads.

29. A computer usable medium having computer readable data structure means embodied thereon, wherein the computer readable data structure means is used for a database for geographic data comprised of data records that represent segments of roads located in a geographic region, said computer readable data structure comprising:

a plurality of parcels, each of which contains a separate portion of the data records, such that each parcel contains the data records that represent the segments of roads located in a separate one of a plurality of areas into which the geographic region is divided;

wherein an improvement comprises:

a plurality of first indexes, each of which is associated with a respective one of the plurality of parcels, wherein each first index defines a plurality of sub-areas formed of the area associated with the parcel associated therewith; and

a plurality of second indexes, each of which is associated with a respective one of the plurality of parcels, wherein each second index associates each of the data records in

the parcel associated therewith to at least one of the plurality of sub-areas defined by the first index associated with the parcel,

whereby the computer readable data structure means identifies which of the data records represent segments of roads located in any specified sub-area of any specified area.